Research Note

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HAND PREPARATION OF SEEDBEDS IMPROVES SPOT SEEDING OF LODGEPOLE PINE IN WYOMING

James E. Lotan and Allen K. Dahlgreen[1]

ABSTRACT

Hand-prepared, 12-inch-square seed spots greatly reduced the amount of seed required to spot seed lodgepole pine on slopes less than 45 percent in the Abies lasiocarpa/Vaccinium scoparium *habitat type in Wyoming. Viable seed:seedling ratios after 3 years were 5:1 on scalped 12-inch-square seed spots on the level and along the slope, 12:1 on scalped 5-inch-square seed spots along the slope; and 60:1 for seed sown in the ash and duff left by broadcast burning of logging slash. Percentages of spots stocked were as follows: 72 percent for scalped 12-inch squares on the level; 64 percent for the scalped 12-inch squares on the slope; 38 percent for the scalped 5-inch squares on the slope; and 10 percent for the ash-duff seedbeds.*

The ability to successfully direct seed lodgepole pine (*Pinus contorta* Dougl.) will provide a useful and flexible alternative in regenerating stands, especially where serotinous cones do not store enough seed to regenerate the area. Spot seeding success depends largely upon proper selection of favorable sites as well as maintaining minimal levels of seed-eating animals and of competing vegetation. A major cause of lodgepole pine seedling mortality seems to be soil-moisture depletion caused by competing vegetation (Wagg and Hermann 1962, Lotan 1964, Stermitz 1968).

Spot seeding usually insures greater regeneration success than broadcast seeding because seed is placed on favorable microsites and directly covered with soil. Moreover, spot seeding requires far less seed than broadcast seeding (Smith 1962). This paper reports regeneration success of lodgepole pine three growing seasons after spot seeding four different seedbeds.[2]

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[1]Respectively, Research Silviculturist, stationed in Bozeman, Montana, at the Forestry Sciences Laboratory, maintained in cooperation with Montana State University; and Forester, Branch of Silvicultural Practices, Intermountain Region, USDA Forest Service, Ogden, Utah.

[2]This paper is the result of an Administrative Study conducted by the junior author, in cooperation with Bridger National Forest personnel.

LOCATION AND METHODS

The test was conducted in the *Abies lasiocarpa/Vaccinium scoparium* habitat type in western Wyoming on the Greys River drainage of the Wyoming Range. All sites are on northerly slopes at an elevation of 7,900 ft. The slope and aspect of each site are given below.

	Percent slope	*Aspect*
Site 1	35	N
Site 2	45	WNW
Site 3	15	WNW

The areas were logged in 1966 and the slash broadcast burned in late September 1966.

Seeds (90 percent viable) were sown June 15-16, 1967, using a Panama seeder. The machine used was calibrated to place 12 seeds (1) in approximately one-half to 1 inch of ash and duff, (2) on scalped 5-inch squares along the slope, (3) on scalped 12-inch squares along the slope, and (4) on scalped 12-inch squares on level benches (fig. 1). On the scalped areas, seed was covered with approximately one-eighth inch of mineral soil, but on the remaining areas it was mixed into the ash and duff about one-eighth inch. Each set of treatments was replicated systematically 50 times on each of the three sites. Replicates were spaced approximately 6 to 8 feet apart along a transect randomly placed across the harvested area.

Rodents were controlled by means of poison baits. Treatment consisted of distributing one-half pound of treated wheat per acre throughout the study area and surrounding 100-foot-wide buffer zones. Both the wheat and the tree seed had been treated by application of 1 pound of 50% W. P. endrin and 5 pounds of anthroquinone, with latex sticker and aluminum powder coating.

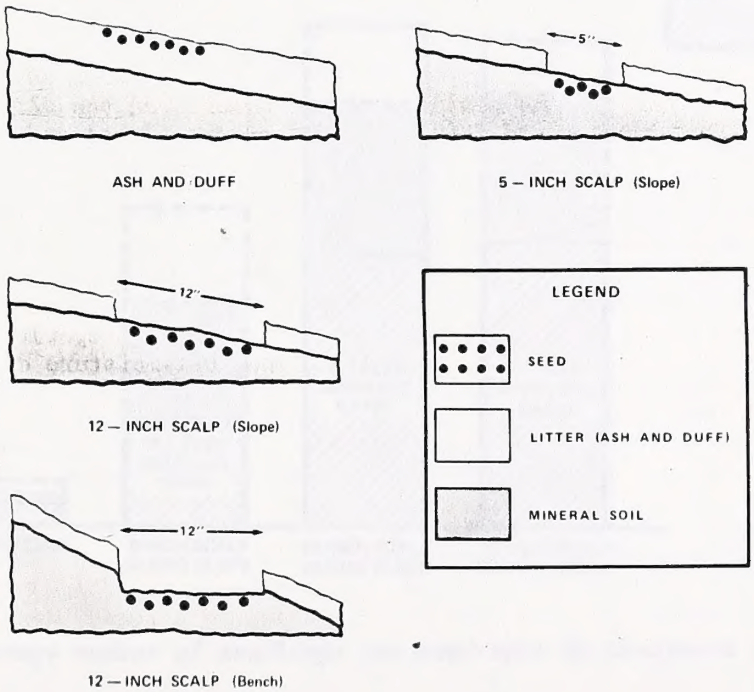

Figure 1.--Four seedbed treatments used in spot seeding lodgepole pine. (Schematics are not scaled proportionately.)

Seedlings were tallied twice during the first year, August 8 and September 25, 1967, and once during the third year, September 15, 1969. Data were analyzed by analysis of variance and treatment means compared by using Scheffé's *S* test for multiple mean comparisons (Scheffé 1959).

RESULTS

Lodgepole pine seedling establishment increased significantly when seed spots were placed on scalped areas rather than in the ash and duff. As shown, both the number of surviving seedlings (fig. 2) and the percentage of stocked plots (fig. 3) increased with the size of the scalp.[3] There were no real differences between the 12-inch slope and 12-inch bench treatments; however, it was beneficial to increase the size of the scalped areas from 5 to 12 inches. Viable seed:seedling ratios after three growing seasons were also most favorable on the scalped spots (fig. 2)--5:1 for both 12-inch treatments (2.35 seedlings per spot); 12:1 for the 5-inch treatment (0.89 seedlings per spot); and 60:1 for the ash and duff treatment (0.18 seedlings per spot).

One of the most important considerations of spot seeding is the percentage of stocked spots. Here, too, there was no difference between the two 12-inch treatments, but stocking on both 12-inch treatments was approximately double that on 5-inch scalps.

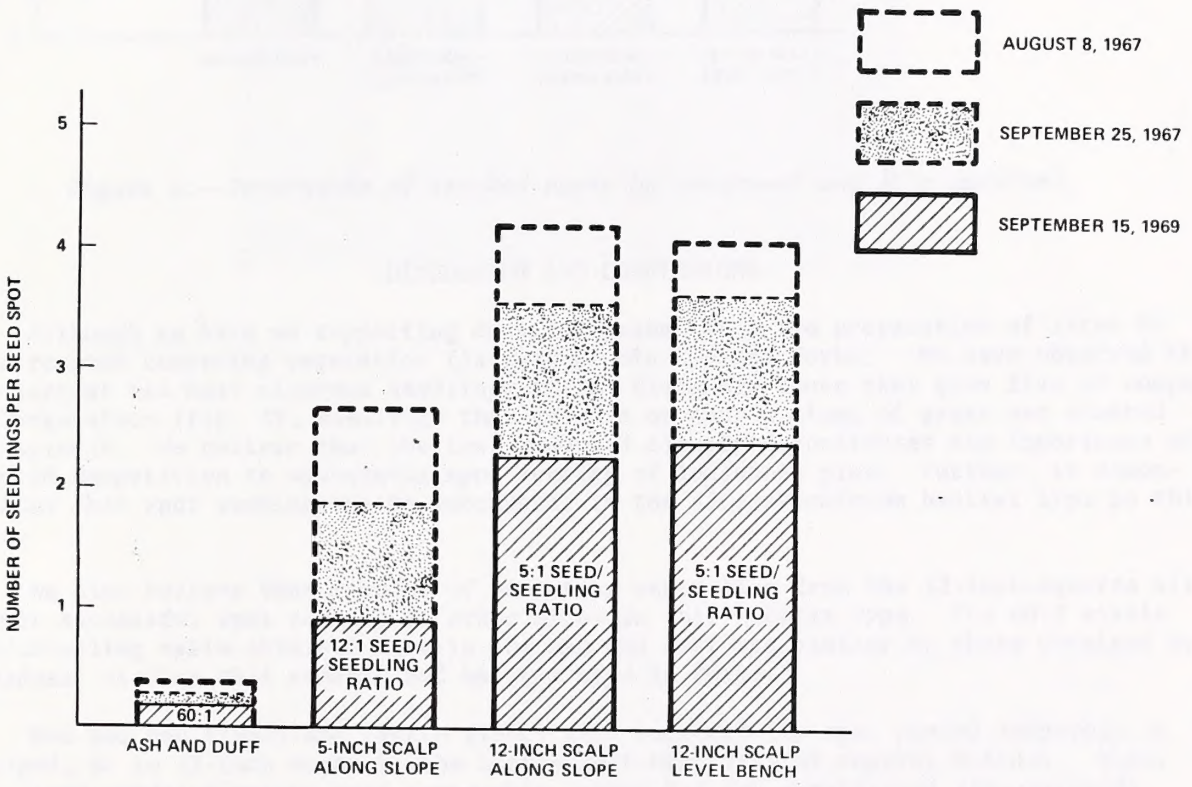

Figure 2.--Average number of seedlings per seed spot by treatment and date examined.

[3]Data from the three sites were pooled because there were no significant treatment X site interactions.

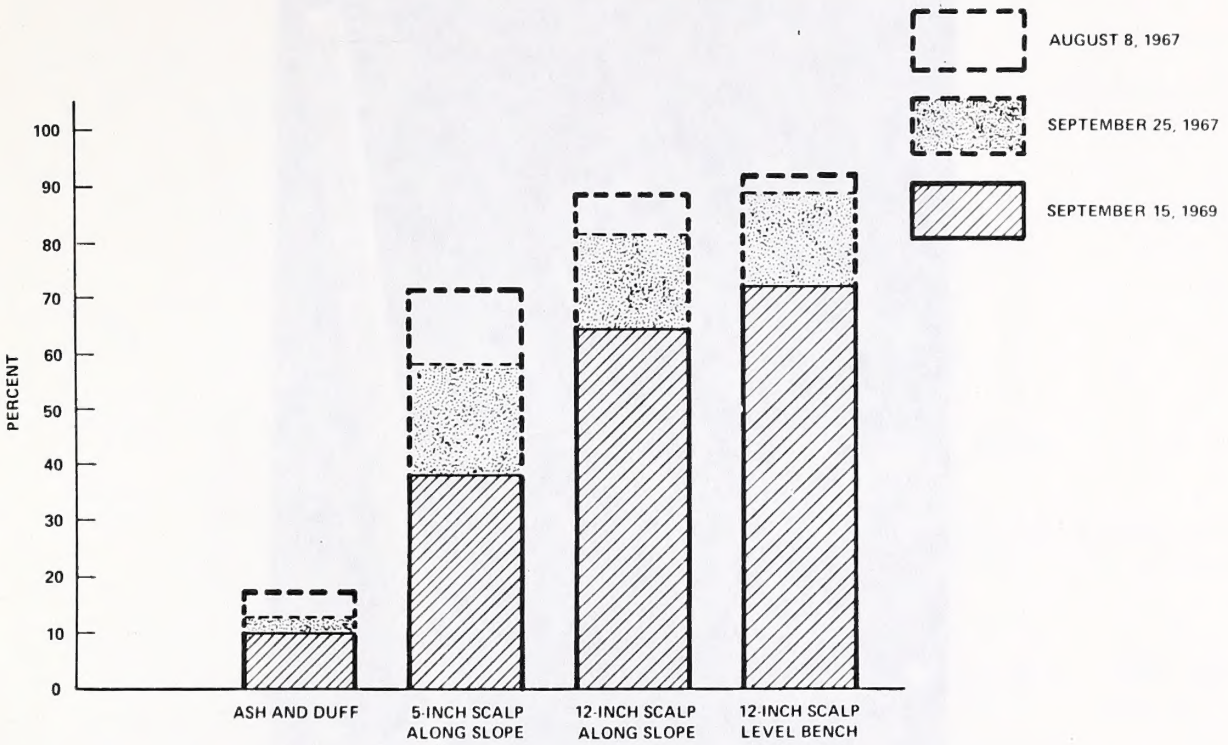

Figure 3.--Percentage of stocked spots by treatment and date examined.

DISCUSSION AND CONCLUSIONS

Although we have no supporting data, we assume that the preparation of sites by hand reduced competing vegetation (largely graminoids and forbs). We have observed that the largest and most vigorous seedlings in the field are those that grow free of competing vegetation (fig. 4); seedlings that grow in or near a clump of grass are stunted and spindly. We believe that the test reported clearly demonstrates the importance of reduced competition to successful spot seeding of lodgepole pine. Further, it demonstrates that spot seeding can be successful in the *Abies/Vaccinium* habitat type in this area.

We also believe that removal of competing vegetation from the 12-inch-squares will permit successful spot seeding in other areas in this habitat type. The 60:1 viable seed:seedling ratio obtained here in the ash and duff was similar to those obtained by broadcast seeding this seedbed and habitat type in Idaho.[4]

Roe and Boe (1952) and Tackle (1961) also successfully spot seeded lodgepole on scalped, 6- to 12-inch areas in the Little Belt Mountains of central Montana. Here, too, seed:seedling ratios were comparable, about 5:1 for established (10-year-old) seedlings. When a decision to direct seed has been made we recommend removal of competing vegetation on scalped areas about 12 inches square prior to spot seeding lodgepole pine in the *Abies/Vaccinium* habitat type in Wyoming. It is likely that the treatment will also be successful on *Abies/Vaccinium* type elsewhere.

[4]Data on file, Intermountain Forest and Range Experiment Station, Bozeman, Montana.

Figure 4.--Eight-week-old lodgepole pine seedling growing free of competing vegetation. Marker is a plastic toothpick.

Costs of seed for spot seeding should be less than those for broadcast seeding. Seed costs for spot seeding should also be less than planting stock costs. Rodent control, fencing, and other protection costs would be additional and will vary with the situation on the planting site. Thus, the cost advantage of spot seeding largely depends upon the placement of seed in favorable microenvironments. In addition, if seed spots are prepared by hand, spot seeding results improve.

Seed requirements can be calculated (depending upon the forester's stocking objectives) from an estimate of the number of stocked spots desired, viable seed:seedling ratios, and the viability of seed used.

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